INTEGRATED WATERSHED MANAGEMENT: COMPARING SELECTED EXPERIENCES IN THE U.S. AND AUSTRALIA

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INTRODUCTION

The emergence of integrated watershed management (IWM) in several countries throughout the world reflects a growing recognition of the multiple—often competing—uses of water, and the increased awareness of the interrelationships of water systems with other physical and socioeconomic systems. There are many different definitions and descriptions of the concept. Margerum and Born (1995, 377) contend that integrated management "promotes a holistic view that requires looking at the full range of activities and programmes that affect a system or region and developing strategies for managing critical components and interrelationships." Mitchell (1990) notes that integrated watershed management involves the systematic consideration of the various dimensions of water, its interaction with other systems, and with social and economic development. Similarly, Guruswamy (1989) asserts that the concept of watershed is now extending to beyond the physical boundaries to include the service areas created by humans.

Research on the practice of integrated management identifies interorganizational coordination as an important component (Mitchell 1986; Lang 1986b; Gilbert 1988; Johnson and Agee 1988). Defining coordination more broadly, Margerum and Born (1995) suggest that the key to translating IWM into practice is interaction in the form of stakeholder collaboration and public participation. The difficulty for practitioners is that there are currently no models for institutions and processes to guide their efforts. Despite this shortcoming, practitioners at the state and regional level throughout the world are forging ahead and applying the concept. It is therefore instructive to examine these efforts and compare approaches in two countries where the concept has received considerable attention.

There currently is no national watershed management policy in the U.S., except for U.S. Environmental Protection Agency guidance that promotes the concept to the states (U.S. EPA 1992a). However, several states and localities are pursuing watershed-based planning and management strategies. In Australia, the concept is being advocated by states throughout the country under the terms Integrated Catchment Management and Total Catchment Management (the terms Integrated Watershed Management and Integrated Catchment Management can be used interchangeably). In the late 1980s, several states passed integrated watershed management policy directives or legislation, establishing a number of stakeholder committees to implement the concept.

In this paper, I briefly review integrated watershed management in selected cases in the U.S. and Australia. I compare the experiences in the two countries, focusing on process and institutional structure. This comparison reveals several similarities and differences. The comparison also reveals strengths, weaknesses, and a range of approaches for improving IWM implementation.

The findings in this paper are based on three research efforts. For my doctoral dissertation, I researched eight integrated environmental management case studies, many of which were watershed projects. While working for the Wisconsin Department of Natural Resources, I researched watershed management projects across the U.S. to examine different approaches and roles. Since January 1995, I have been a visiting Fulbright scholar in Australia, examining integrated watershed management. To date, I have examined several case studies in the states of New South Wales and Queensland. I have also reviewed literature and agency documents from across the country.

BACKGROUND COMPARISON: THE UNITED STATES AND AUSTRALIA

In the eastern half of the United States (east of the 100th parallel), rainfall is generally reliable and watershed flows are usually consistent. The western half of the country receives varied rainfall, but the presence of large river systems flowing from high rainfall mountainous areas through arid and semi-arid areas has offered many opportunities to exploit these systems for human use. In contrast, Australia is often referred to as the driest continent on earth (see Table 1). There are only a few large river systems and few areas subject to snowfall to contribute to surface runoff. Compared to other continents of the world, "Australia not only has the lowest precipitation and runoff in proportion to its area, but also the lowest percentage of runoff to rainfall" (Pigram 1986, 18). Many of the high rainfall areas are located close to the coastline and over two-thirds of the continent could be classified as desert or semi-arid. Furthermore, the nature of Australia's river systems and an erratic pattern of precipitation also lead to recurrent drought and flood (Pigram 1986).

Table 1: Statistical Comparison

	United States	Australia
Area[a] (sq. km.)	9,809,155	7,682,300
Mean Annual Runoff[b] (cubic kilometers)	5,300[c]	301
Population[a]	248,700,000	16,850,000
Density (people per sq. km)[c]	26	2
Gross Domestic Product[a] (millions of U.S. $)[d]	5,516,000	253,000
Comparative GDP[a] (as percent of U.S.)	100 %	4.3 %
Average Income[c] (U.S. $)	14,565	9,196

[a] (Europa Publications Limited 1994)
[b] (Shiklomanov 1993)
[c] (The Economist Publications Limited 1987)
[d] Calculation: $AUS x 0.74 (approximate current exchange rate)
[e] North America = 8,200 km^3/year; Canada and Alaska = 5,300 km^3/year; Central America 1,200 km^3/year.

There are also considerable socioeconomic differences between the two countries (see Table 1). The population of the United States is over 15 times the population of Australia. The U.S. GDP is more than 22 times greater than Australia's, and its average income is 58 percent higher. The population distribution is also quite different. The vast majority of Australia's 16.8 million people are concentrated in coastal areas, leaving large areas of the central part of the continent virtually uninhabited. While there are sparsely populations areas in the U.S. and concentrations of people along the eastern and western coasts, there is a more even distribution of population than Australia.

Many institutional differences between the countries stem from differences between the U.S. federal republican system and Australia's parliamentary system. In the U.S., the President and congressional representatives are elected through popular vote. The President is the head of state and appoints the administrators of federal agencies, subject to the approval of Congress. In Australia, ministers are directly elected to Parliament by popular vote, and the majority party or coalition of parties elects a Prime Minister from its ranks. The Prime Minister appoints ministers from the party or coalition to head federal agencies. In both countries, the federal system is typically mirrored at the state level. However, states have considerably more power in Australia than in the United States. Australian states have primary responsibility for environmental and natural resource management. In the U.S., this authority is held by the federal government, but often delegated to the states by federal agencies under legislative authority. As a result, federal agencies are more commonly involved at the state and regional level in the United States in both direct and oversight roles. For example, an integrated watershed project on the upper Wisconsin watershed in Wisconsin involved five federal agencies in addition to state agencies and local government. Comparable watershed management efforts in Australia typically involve no federal agencies.

Local government structure and roles also differ in two countries. In Australia, many more powers are controlled at the state level, including education and police and fire protection. Furthermore, many states in Australia (including New South Wales and Queensland) have reduced the number of local governments through amalgamation. Such actions are extremely rare in the U.S., usually occurring only through local initiation.

IWM IN THE UNITED STATES

In the U.S., water resource planners have long recognized the need for a regional approach that interrelates the multiple uses of water. Early approaches defined a comprehensive approach

to river basin management as multiple-use impoundment projects for flood control, water use, recreation, and economic development (Krutilla and Eckstein 1958; Wengert 1981). The 1927 Rivers and Harbors Act called upon the U.S. Army Corps of Engineers to develop comprehensive multi-purpose river basin plans for navigation, irrigation, hydroelectric power, and flood control on the major rivers of the United States (Caulfield 1984). This concept eventually translated into a theoretical model of river basin management called "Integrated River Basin Management" that advocated multiple use water storage projects, comprehensive regional development, programs for land and water management, and unified administration (White 1957; Saha 1981; Wengert 1981; North and others 1982). This concept gained particular prominence with the creation of the Tennessee Valley Authority in the 1930s and culminated in 1965 with the passage of the Water Resources Planning Act (Wengert 1981). However, soon after passage of the Act, a "new pluralism" developed that challenged the orientation towards river development, questioned environmental impacts, challenged costs and benefits, criticized the technocentric approach, and was generally more critical of publicly-sponsored projects (Saha 1981; Wengert 1981; Gregg 1989; Muckleston 1990).

The "new pluralism," combined with the fiscal constraint in the 1970s and 1980s, diminished the support for large-scale water development projects. Water quality legislation in the 1970s encouraged watershed-scale planning under the 208 program; however the dominant concern at the time was point source control. Current debate on future approaches to water resources management is refocusing on the watershed and encouraging managers to use a more integrated, ecologically-minded approach (Thomas 1990; Burton 1991; Dodge and Biette 1992). For example, the U.S. Environmental Protection Agency and early drafts of the new Clean Water Act are promoting the "watershed approach" to address water quality management. Many authors now liken watersheds to ecosystems (Lotspeich 1980; Wengert 1981; Burton 1986; Allen and Hoekstra 1992) and the "watershed approach" has been equated with integrated management (Easton and others 1986). However, there is currently no national policy for integrated watershed management; it has largely developed through regional and state initiatives.

Wisconsin

The Wisconsin Department of Natural Resources (WDNR) is an environmental superagency encompassing both resource management and environmental regulation functions. The WDNR is headed by a governor-appointed seven member board that approves regulatory and policy changes, and hires and fires the executive officer. The department's 3,000 employees are divided among a central office and six regional offices.

Integrated Watershed Management is developing in Wisconsin through several inter-linked water resource policies. Department staff prepare plans for each river basin in the state, which are used to guide departmental monitoring and management actions, including its oversight of municipal treatment systems. For communities with a population of over 20,000, regional planning commissions (or other designated organizations) must prepare WDNR-approved regional sewer service area plans. Planning commission staff identify boundaries for sewer service, map wetlands and address water quality impacts. Any modifications, including sewer extensions, must be approved by the planning commission, subject to WDNR approval.

The basinwide plans also identify watersheds and sub-watersheds in each basin that are water quality impaired due to nonpoint source pollution. These watersheds can be nominated for statewide acceptance into the Wisconsin Priority Watershed program. The program is one of the most advanced nonpoint source programs in the country, however it is still largely voluntary. WDNR watershed planners work with stakeholder committees in the region to identify impairments and targets, and develop an action plan. The program provides grants to individual landowners and communities to share the cost of efforts such as: controlling barnyard runoff, fencing off riparian areas, constructing manure storage facilities, cleaning streets, and educating citizens about nonpoint source pollution. The program is implemented in cooperation with the Wisconsin Department of Agriculture, Trade and Consumer Protection and county land conservation departments.

Florida

The management of water resources in the State of Florida is divided between the Florida Department of Environmental Regulation (DER) and the state's five regional Water Management Districts (Districts or WMDs). The different histories of the Districts, the greater population pressures in southern Florida, and higher incidence of flood and drought in southern Florida have all resulted in more substantial powers for the Southwest and South Florida districts (Margerum and Born 1991).

Several water management districts are developing integrated watershed management approaches through several programs and authorities. Florida legislation requires regional planning commissions to assess large developments for their physical and socioeconomic impacts; most water management districts assess water resource impacts. The state also allocates funds to the districts to purchase lands critical for water quantity, water quality and recreation. The South and Southwest Florida Districts have been delegated special authority to permit stormwater. The most substantial legislative authority is the Surface Water Improvement and Management Act (SWIM). The Florida legislature passed the SWIM Act in reaction to widespread algae blooms in Lake Okeechobee caused by channelization and nonpoint source pollution. The Act directs the districts to prepare a list of priority water bodies based on statewide criteria and develop 'Pollution Load Reduction Goals' (PLRGs) for water bodies. The PLRGs are targeted reductions in pollutant loadings needed to achieve watershed management goals such as flood protection, water supply, water quality, and environmental system protection and enhancement. For example, the PLRG for the Lake Okeechobee SWIM Plan is a 40% reduction in phosphorus (SFWMD 1993). The districts are required to develop clean-up plans for the water bodies they have listed and issue permits for nonpoint "discharge" to surface water. The state reviews each of the

district plans and evaluates the cost relative to the water quality improvements.

Oregon Watershed Management Strategy

The State of Oregon has begun developing initiatives to move towards a watershed management approach. They have developed a strategy that proposes to use Local Watershed Councils to coordinate actions among agencies for high priority watersheds. The Councils involve local, state and federal agencies, and encourage broad-based public support to help develop and implement Watershed Action Programs. Proposed legislation would enable the Strategic Water Management Group (a multi-agency forum) to better oversee the process by enhancing its authority to coordinate among agencies (OWRC 1993).

The Oregon Department of Environmental Quality (DEQ) is the lead agency for nonpoint source pollution. The DEQ has agreements with the Department of Agriculture and federal agencies to facilitate nonpoint source control programs on most lands in Oregon. Dairies and feedlots that collect, store, and dispose of liquid manure waste are regulated under a general permit. The permit is issued by the Oregon Dept. of Agriculture, with assistance from the Soil and Water Conservation Districts (OWRC 1993).

New Jersey

New Jersey has recently initiated integrated watershed management efforts in the state through a pilot project on the Whippany River. The New Jersey Department of Environmental Protection (NJDEP) has committed several full-time staff for over a year, holding public meetings, establishing advisory committees, reviewing information, and collecting data. The Whippany project currently has a twenty-two member advisory committee, four subcommittee, and NJDEP staff and administrative teams (Cohen 1994).

Puget Sound

In 1985, the Oregon legislature passed the Puget Sound Water Quality Act, which created the Puget Sound Water Quality Authority (Authority). The Authority is charged with adopting and overseeing the implementation of a comprehensive Puget Sound Water Quality Management Plan (Plan). The Authority is overseen by a full-time at large chair, six part-time members from each of the congressional districts bordering the sound, and two non-voting members from the departments of Ecology and Natural Resources.

The Authority has no direct power and the Plan is only advisory. However, it does have indirect power through its quarterly reporting to the Governor and legislature on the progress of the Plan and the agencies affected by the Plan. The Plan is also important for coordinating existing management activities and new initiatives. Stormwater and wetland regulations have been coordinated, point source controls have been tightened, and voluntary nonpoint source control programs have been established (Fletcher 1990).

The 1987 Puget Sound Water Quality Management Plan proposes a comprehensive approach that addresses major causes of wetland loss, water quality degradation, and sources of sediment contamination. The Action Plan for the Water Quality Management Plan identifies a number of different elements, including nonpoint source pollution, municipal and industrial discharge, stormwater and combined sewer overflows, and wetland protection (PSWQA 1987). The plan does not address urbanization issues or land development impacts on water quality.

Chesapeake Bay

In 1987, Maryland, Virginia, Pennsylvania, the District of Columbia, and the United States Environmental Protection Agency signed the Chesapeake Bay Agreement. The goal of the Agreement is to reduce point and non-point sources of pollution by the year 2000, including a forty percent reduction in nitrogen and phosphorus entering the Bay. The agreement also emphasized land use and control of development as important approaches for protecting the Bay (Barker 1990).

In Virginia, each local government in the designated area must delineate Resource Protection Areas (RPAs) and Resource Management Areas (RMAs). The RPA consists of the land most essential to reducing nonpoint source pollution (wetlands, shores, and other critical areas), including a 100 foot buffer strip (minimum) along the side of any tributary stream. The RMA encompasses areas of secondary importance for water quality improvement, and must be established as a contiguous boundary to the RPA. Local governments also have the option of creating Intensely Developed Areas (IDAs), where development can be concentrated in areas already developed or where redevelopment is desired.

The land designated in the RPAs and RMAs are subject to land use regulations called general performance requirements. The requirements encourage limited development of the land, preservation of vegetation, and minimization of impervious cover. Developments exceeding 2500 square feet must undergo a development plan review. Development in the RPA areas is allowed only if it is "water dependent" or "redevelopment."

A Local Assistance Board composed of members appointed by the Governor assists local governments in designating its areas and developing its land use regulations. The Board may tell the local government whether it's designations are consistent with the Board's criteria, but it has no explicit authority to approve or reject a local government's program proposal. (Barker 1990)

Maryland's Chesapeake Bay Critical Area Protection Program is very similar to Virginia's program, although it provides more oversight authority. The oversight is carried out by the Chesapeake Bay Critical Area Commission (Commission), which is composed of twenty-six voting members from the jurisdictions affected by the Program.

The initial planning area of the Critical Area is established by the statute. Local governments may petition to the Commission

to exclude lands from the Critical Area. Within its Critical Area, each locality must identify a Resource Conservation Area (RCA) a Limited Development Area (LDA) and an Intensely Developed Area (IDA). Little new development is allowed within the RCA, and what is allowed is subject to strict controls. New development is permitted in the LDA, as long as it will not change the prevailing character of the land use and it conforms to water quality and habitat protection criteria. There are no specific limitations in the IDAs, but regulations require local jurisdictions to reduce urban runoff, reduce stormwater runoff, encourage preservation of trees, and support enhancement of developed woodlands. The Act also presents a detailed list of elements that each program must address, and includes procedures and deadlines for adoption. (Barker 1990)

IWM IN AUSTRALIA

Early in the history of Australia, finding reliable source of water was a major concern for many of country's growing cities. Public development of water resources began with the construction of the first large dam in 1857 to supply the city of Melbourne. Similarly, the Nepean system was dammed to supply water for the growing Sydney population (Pigram 1986). The importance of the Nepean River as a water source for Sydney led to strict controls on land use in the watershed (Burton 1992). New South Wales undertook substantial institutional reform in 1950 when it created the Hunter Valley Conservation Trust to coordinate land and water resource management across the entire basin, with sweeping powers to control soil erosion and other forms of land degradation. Victoria established a similar authority for the Dandenong Valley in the 1960s. Although these actions created organizations with a variety of watershed management functions, they both functioned primarily as a flood mitigation authorities (Burton 1992).

In 1973, the federal government took one of the first steps toward multiple objective planning when it issued a policy statement requiring federal projects to use a multiple objective approach. These official statements signaled significant changes in federal and state legislation for environmental protection (Pigram 1986). Multi-objective management emerged at a watershed scale among watershed management projects developed by soil conservation agencies throughout Australia. In Victoria, the Eppalock Catchment Project undertook a comprehensive approach to soil and water management for a new reservoir. Western Australia developed similar watershed management efforts to address dryland salinity, including introducing strict controls on land clearing (Burton 1992).

Because resource management is largely the responsibility of the states, multiple objective and integrated approaches have evolved differently in each state. However, states have often looked to each other for reform and innovation. The term Integrated Watershed Management (known as Integrated or Total Catchment Management in Australia) first appeared as state policy in New South Wales in 1984. In 1989, the state created the institutional structure to support the policy by passing the Catchment Management Act. Similar efforts were launched at about the same time in Western Australia and Victoria, and more recently in Queensland.

New South Wales

In 1989, New South Wales passed the Catchment Management Act, which established a state coordinating committee, defined objectives and functions for watershed committees, established a process for membership, and redefined the role of previously established watershed management trusts. The state coordinating committee is composed of senior department officers and representatives of land users, environmental interests, local government, and watershed committees. Their function is to coordinate implementation of management strategies, monitor and evaluate the strategies, and advise the responsible ministers.

The watershed committees are appointed by the minister of the responsible agency (the Environmental Protection Authority in the Sydney metropolitan area, and the Department of Land and Water Conservation in the rest of the state). The watershed committees must be composed of a majority of landowners or users, as well as representatives of local government, agencies, business and industry, environmental interests, and other groups. The responsible agency provides the staff for its committees, usually consisting of a full- or half-time coordinator. In some cases, local government or other interests provide funds for additional staff or office space. The Hunter Valley and Hawkesbury-Nepean watersheds are overseen by Catchment Management Trusts. Trusts have slightly different compositions and the authority to raise revenue by levying fees.

Each committee develops a management strategy for the watershed, which includes identifying actions for the committee, agencies, local government and other stakeholders. It is also responsible for local action groups with resources. The most significant of these is the Landcare program, which is a federal program that provides states with funds to distribute to local land management demonstration projects. In New South Wales, the funding agency asks the watershed committees to evaluate and rank the proposed projects in their region and forward them to a state committee that distributes the funds.

Queensland

In Queensland, Integrated Watershed Management has been initiated through state agency policy rather than legislation. The Queensland Department of Primary Industries (DPI) initiated the program in 1991 in response to community interest in river watershed approach to dealing with resource degradation issues (AACM and Centre for Water Policy Research 1995). DPI policy was launched by initiating five pilot projects. Since initiation, nine additional watersheds committees have been formed and several more are in development.

Formation of watershed management committees in Queensland has taken place through a less rigid process. Generally, the DPI lets local groups form a steering committee, which can then

apply to the department for operating grants and formal endorsement as a committee. The DPI provides recommendations for committee membership and formation process, but does not stipulate its composition. It recommends that the committees include members from interest and community groups and a representative of the Department of Primary Industries; it also recommends representatives of local government and other government departments and organizations, with no more than 25% of the committee coming from each of these categories (DPI 1994). Each committee is expected to prepare a strategy that recommend actions for the watershed. Committees endorsed by Queensland DPI become eligible for establishment grants, state-funded staff, and operating grants

COMPARISON OF APPROACHES

The discussion above demonstrates there are considerable differences in the setting and background for integrated watershed management in the U.S. and Australia. The focus my research is the institutional structure and process of IWM. In this area there more similarities as differences (see Table 2). The purpose of this section to describe the similarities and differences, and analyze the strengths and weaknesses of each approach. The analysis also considers some of the options for building upon the strengths and overcoming weaknesses.

Similarities

1. IWM Planning versus Implementation

In both the U.S. and Australia, many IWM efforts have produced plans and strategies through a consensual planning process, but have stalled during implementation. These implementation difficulties stem, in large part, from the grafting of IWM onto an institutional structure that favors single-issue, single-agency decision making. While IWM identifies cross-cutting issues and a range of actions, management responsibilities remain largely divided among a wide array of agencies and local government authorities, many of which are highly focused on their direct responsibilities. Figure 1 depicts graphically the difficulty that Integrated Watershed/Catchment Management has when confronted with the numerous federal, state and local lines of responsibility.

In both countries, part of the solution may lie in reforming the institutional structure to support integration. Cases where participants have made these changes appear to be making more progress during the implementation phase. These reforms do not necessarily entail massive restructuring of state and local government, but changes that encourage greater sharing of information, more interorganizational coordination, and less autonomous decision making. Addressing these changes requires action at the watershed level, as well as the state and even national levels. There are at least five different types of institutional changes: (1) positions for new decision makers; (2) new mechanisms for exchanging information; (3) new processes for joint decision making; (4) new authority; and (5) new financial mechanisms to encourage or discourage action.

New forums for collective decision making can lead stakeholders to pool resources, share information, and work collaboratively. For example, landowners in Australia have formed Landcare groups to encourage better land management in their locality. These groups provide landowners with a new position from which to influence actions. The Johnstone Catchment Management Committee (CMC) is developing new positions for decision makers by establishing memorandums of understanding (MOU) with each participating organization that has implementation responsibility. The purpose of the MOUs is to obtain concrete (although largely symbolic) commitment to implementation actions, including a time frame. Mechanisms for exchanging information between stakeholders can help coordinate agency programs and staff. In New South Wales, many watershed committees ask agency representatives to prepare activity reports for each meeting that describe agency activities in the watershed. This helps improve communication between stakeholders, sometimes leading to collaborative efforts. New processes for making decisions jointly can also help produce management actions that consider a broader array of issues and factors. For example, on the Mississippi River, state and federal agencies have created “on-site” technical teams for reviewing dredge disposal practices and locations. This helps ensure that disposal options will consider such factors as cost, alternative uses of dredge spoils, wetland impacts, fish habitat impacts and floodplain issues. Stakeholders may decide that new authority is required to address problems for which there were previously no management tools. In the lower Wisconsin River valley, stakeholders helped create a regional management board composed of state and local representatives to oversee regional land use and resource management activities. The primary new authority of the Riverway Board is regional performance standards that protect the aesthetic qualities of the river valley. Lastly, new financial mechanisms may be necessary to fund activities or provide incentives and disincentives for implementation. In New South Wales, applications from Landcare groups for state funding are submitted to watershed committees for evaluation and ranking. This helps ensure that Landcare group proposals meet regional resource management objectives

These are examples of solutions derived at the watershed level; many actions at this level are constrained by the institutional structure at higher levels. Land use planning in a watershed may be limited by land use and infrastructure decision making across the region. The actions of state agency staff can be limited by state agency priorities and policies and federal programs. Therefore, a key remaining hurtle in implementing IWM will be to develop a process for resolving these institutional constraints In a national review of watershed management in Australia, researchers recommended multi-disciplinary planning teams and co-financed partnership to co-manage natural resources. “Integrated resource management is weakened by poor inter-institutional communication and by ineffective linkages between bottom-up community participation and top-down policy and public investment components” (AACM and Centre for Water Policy Research 1995, 41).

2 Stakeholder Commitment

A critical issue in many IWM cases is the level of commitment among both governmental and non-governmental stakeholders. In my dissertation research, I found that stakeholder commitment was one of the critical elements to success. In many watersheds there is a varying degree of commitment by governmental organizations (federal and state agencies, local government). Some of the reasons for lack of commitment appear to be: fear of a new level of governance, perception that it is an attempt by one agency to increase power, perception that the effort is an agency program rather than a collective effort, and lack of resources to be involved.

In Australia, I have found a perception among some government representatives that IWM is a "one-way street." These participants view IWM as a forum for sharing information, providing their technical expertise, describing their activities, and helping to identify problems; however, many do not view the IWM committees as influencing the way their organization conducts its business, allocates its resources, or sets its priorities. Other agencies have completely overlooked watershed committees as a source of input. For example, the former New South Wales Department of Public Works created estuary management committees that overlap with existing watershed management committees. In contrast, some agencies have embraced IWM, using the watershed management committees to help identify issues and management actions. Overcoming these weaknesses will require greater collaboration at the administrative level, and/or political pressure to impel greater support.

Commitment among non-governmental stakeholders is more complex, tending to hinge more on personality. The chief problem is that the view of the stakeholder may not reflect the view of the organization or group the person represents. In many cases, the person represents an unorganized group (such as farmers or recreationists), which means their opinions may or may not reflect the group as a whole. Representatives of organized groups demonstrate varying levels of feedback to their organizations. As with the unorganized groups, resolution by an organization's representative may not resolve the issue for the organization's members.

One approach to addressing commitment of both government and non-government stakeholders is public participation. Stakeholder groups gain considerable mutual knowledge and understanding that often is not translated to the community as a whole. Therefore, the content and process of the planning and implementation processes must be communicated to the public for their reaction and input. My research indicated that public involvement is important to building support for implementation and encouraging a range of stakeholders to carry out their implementation responsibilities (Margerum 1995).

3. Resource Demands of IWM

In both countries, integrated watershed management is confronting the issue of funding. Developing a statewide program can require considerable resources. A full-time coordinator is essential; additional support staff is often very important. While this is not a significant expenditure for one watershed, when multiplied across twenty or thirty watersheds it requires significant resources or shifts in resources.

The implementation phase of IWM is especially resource intensive because participants usually pursue several actions. Each action requires a lead person to guide it, maintain momentum and coordinate with other agencies and organizations. The difficulty in both countries is that there are usually many more actions than people willing or able to lead them. Many government participants in IWM efforts have full-time responsibilities and are not allocated time to implement actions unless it directly relates to their responsibilities. Many citizen participants have full-time jobs and are often not aware of the intricacies and workings of local and state government. Consequently, few people are available to carry out the day-to-day liaison and communication work necessary to implement a watershed strategy. Responsibility typically rests with overworked coordinators, and the few committee members able to commit additional time. The result is often burnout among both members and coordinators.

There are at least three approaches to addressing the resource issue. First, as noted above, stakeholders can adapt management institutions to encourage more coordination and sharing of management responsibilities. Second, state agencies and local government can become stronger partners in watershed management (i.e., more committed). Both of these approaches could be addressed through integrated regional planning, as New Zealand has been promoting (Ericksen 1990; AACM and Centre for Water Policy Research 1995). Watershed plans could form the basis of regional plans to guide a range of government policies and actions. This would help bring resource management issues into the forefront with decision making about land use, economic and other issues. It would also reduce the burden on agencies unable to participate in every watershed management effort in a region.

The third approach is new sources of funding to support projects and additional staff. In New South Wales, watershed management trusts have the power to raise revenue, allowing them to employ several staff and fund projects. This gives them considerably more options in directing implementation efforts, including hiring specialists and funding "on-the-ground" projects such as streambank rehabilitation. The Illawarra watershed committee, located south of Sydney, has solicited financing from local councils to fund projects, office space and additional staff. An approach being advocated in the U.S. is to allow point source dischargers contribute funds to develop a nonpoint control program in exchange for more stringent point control discharge requirements. For some pollutants, the nonpoint sources are a more significant source and can be more cost effective to control.

4. Implementation Tools

In both countries, many of the IWM strategies target highly interrelated problems, such as nonpoint source pollution and overland flooding. These issues are difficult to address because they involve numerous people and actions. Government

agencies often find regulation unpalatable because of public opposition. The number of people potentially targeted by regulations or financial incentives often makes programs to address these problems unwieldy and expensive. A common option is to develop information and education programs, which use newsletters, fact sheets, demonstration projects, school programs, community groups, and other techniques to spread the message. However, researchers have found that education and information programs have only limited success in influencing action (Napier and others 1984; Hooper 1995).

One alternative is to put the onus of regulatory responsibility back onto the community. Rather than regulating actions through state or federal agencies, some watershed stakeholders are developing local and regional capacity. For example, landowners in the Liverpool Plains in northwestern New South Wales recognized that there were significant problems with flooding, exacerbated by on-farm structures that diverted water to neighboring lands. Stakeholders in the region, including a citizen group called the Liverpool Plains Land Management Committee have helped establish regulations for flood control structures on the plains. Using existing legislation, floodplain management will be overseen by a task force composed of representatives from agencies, local government and the Land Management Committee. In the U.S., a similar, locally-controlled committee was established in the lower Wisconsin river valley to regulate the impact from land use activities.

Stakeholders may also need to critically examine the economic and financial structure of their watershed and region. State and federal funding programs could incorporate cross-compliance mechanisms to ensure that funds are used for activities compatible with IWM objectives. Another potential implementation tool is private funding and financing. IWM participants could target insurance and lending organizations to educate them on the importance of responsible environmental practices for ensuring the viability of their loans. Some insurance companies in the U.S. now require farmers to complete risk assessment checklists to reduce farm accidents such as chemical exposure and spills. In the northwestern United States, a coalition involving conservationists, landowners, industry and the Shoalwater Bay Tribe have formed the Willapa Trust. The Trust has teamed with the Chicago, Illinois-based South Shore Bank to develop bioregional banking. The goal of the effort is to support small business in the region while committing to environmental and social responsibility. Although the program has not been advertised yet, the bank has already attracted $2.5 million (U.S.) in deposits (Brill and Brill 1994). In Tully, Queensland, the canegrowers cooperative has taken a progressive role in allocating new growing land. To ensure adequate production capacity, canegrower cooperatives require landowners to apply to the cooperative to plant additional land in sugar cane. The Tully cooperative will not approve of new allocations that do not meet environmental standards of practice.

Differences

5. Structure of Decision-Making

One of the most significant differences between IWM in the U.S. and Australia is the structure of decision making. In general, the U.S. approach has relied on agency professionals with citizen input, while Australia has transferred considerable decision making power to citizen-controlled committees.

Integrated watershed management in the U.S. is generally viewed as a government concern undertaken by agencies or special organizations. Most IWM initiatives have emerged from resource management agencies concerned about the relationship of their programs to other agencies and decision makers. Citizens are involved through advisory panels and groups. In Australia, watershed management committees direct the planning process. In both Queensland and New South Wales, the committees have a majority of citizen members and are usually chaired by a citizen representative. Although the committee coordinators are paid by state agencies, they are responsible only to the committee. These differences are significant because the Australian model gives citizens considerable power in identifying issues, selecting priorities, and developing strategies.

The strength of the Australian model is that it tends to encourage a holistic and interconnective view of management. The committees tend to approach planning from the perspective of the resource, identifying a broad array of actions that can support the committee's goals. Many cases in the U.S. approach IWM from the perspective of government policies and programs, and how they can be integrated. Furthermore, because U.S. projects are usually sponsored by one agency, they can often be unwittingly dominated by its perspectives and programs.

The strength of the U.S. model is that experienced professionals usually lead the planning process. The planners and other agency participants often have a clear idea of a collaborative planning process, the goals of the effort, and where stakeholder input is needed. Australian watershed committees often struggle to find their mission and purpose when they are initiated. Agency representatives and committee coordinators, sometimes fearful of dominating the committee, often defer leadership to the chair and other citizen representatives. Some committees have decried the planning process, pursuing "on-the-ground" actions. However, many of these groups find themselves several years into the effort without a clear direction and focus, often reacting to the latest issue.

Despite the different approaches, I believe the answer to addressing the weaknesses of both models lies in an effective process. In the U.S., sponsoring agencies of successful integrated management cases approached the planning process with an open agenda and without a predetermined set of the outcomes. The planning process needs to involve a full array of stakeholder representatives, and include processes of obtaining input from the general public. The effort should not be dominated by government representatives, but they need to be willing to commit staff and resources to the effort. Finally, the planning process requires open communication that allows gradual building of mutual understanding and trust (Margerum 1995). In Australia, agencies and local government representatives on watershed management committees need to help the committees develop effective structures and processes.

On some committees, these representatives have helped guide the strategic planning process and facilitate discussions. State IWM coordinating committees and sponsoring organizations can also provide training and support.

6.Approaches to Implementation

Another important difference is the approach that participants take during implementation. In the U.S., I found that participants often view the plan as a product. Under this approach, implementation is carried out independently by stakeholders in accordance to a plan. In Australia, there is a greater tendency for participants to view the plan as adaptive instrument to guide the actions of the committee. Implementation is viewed as an interactive process and the plan is a working document. It is important to emphasize that these are only tendencies; it does not hold true for all cases. However, I believe this general trend is one of the bigger weaknesses of many U.S. approaches.

The literature on integrated approaches suggest that it is often not a linear process of planning and implementation (Olsen 1982; Linstone 1984; Ericksen 1990). Complex problems often require an iterative method, which recognizes that "solving the problem and defining the problem are the same" (Olsen 1982, 9). My research of integrated management case studies found that ongoing teams were often critical for adjusting to changing conditions, coordinating ongoing actions, and addressing new issues or conflicts. In fact, I found that explicit decision making positions for stakeholders is one of the critical elements to a successful integrated approach (Margerum 1995). Many of the watershed management committees in Australia view their role as ongoing coordinating bodies, with the watershed plans guiding their actions like corporate strategies.

CONCLUSIONS

Practitioners in both countries are moving forward with integrated watershed management and struggling to translate the concept into practice. Because the concept is difficult, it is important to learn from these efforts and develop guidance for future practice. Increased success in future IWM efforts will be important not only for better practice, but also to support the concept politically. Integrated management is politically vulnerable, because it can take several years to work through the planning process, and the results are often hard to quantify. This means it will also be important for researchers to monitor and document the array of tangible and non-tangible products of IWM to demonstrate its outcomes. The Australian experience may provide some important lessons. The involvement of key stakeholders in watersheds across New South Wales and Queensland has created support for integrated watershed management that cuts across political parties and philosophies. This kind of support will be important for the future of IWM, as it competes for scarce government funding and matures into an organizing principle for land and water management.

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Table 2: Comparison of IWM Approaches

Similarities:	▸ Difficulties with implementation ▸ Problems with stakeholder commitment ▸ Availability of resources ▸ Limited implementation tools
Differences:	▸ Structure of decision making ▸ Approaches to implementation

Figure 1: Discord Between IWM and Existing Lines of Responsibility